

REMARKS

Claims 1-2 and 4-6 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Arakawa et al. (U.S. Patent No. 6,621,550), in view of Yamada et al. (U.S. Reissued Patent No. RE38,288). In response, Applicant amended independent claims 1 and 4 to clarify that the alignment regulate layer aligns the liquid crystal molecules vertically to the substrate surface, and respectfully traverses.

On page 2 of the Office Action, the Examiner correctly acknowledges that Arakawa fails to disclose an alignment regulate layer being formed on liquid crystal side surfaces of a pair of substrates of a liquid crystal display panel. However, the Examiner identifies Yamada as teaching this feature. (See FIG. 1, Col. 9, lns. 13-15 and 41-62).

Yamada teaches adding a mixture that is to be injected into the display cell in a transparent state. This causes the liquid crystal molecules in each liquid crystal domain to be orientated symmetrically with respect to an axis in a virtual plane parallel with a substrate surface (see Col. 9, ln. 65 to Col. 10, to ln. 2). That is, liquid crystal molecules orientated axissymmetrically, i.e., radially or concentrically with respect to a center disclination point 23 in the liquid crystal domain 17 (see FIG. 3, Col. 10, lns. 22-25).

In contrast, amended claims 1 and 4 now recite that the alignment regulate layer aligns the liquid crystal molecules vertically to the substrate surface. An alignment control agent is added between a pair of substrates and an alignment regulate layer is formed on liquid crystal side surfaces of the pair of substrates by causing the alignment control agent

to adhere thereon. Moreover, the alignment regulate layer has a regulation power for aligning the molecules of the liquid crystal vertically to the substrate.

Yamada merely discloses a liquid crystal display panel in which a liquid crystal into which a photopolymerizable compound and a photopolymerization initiator are added between a pair of substrates 12 and 13 and a plurality of liquid crystal regions 17 partitioned by resin walls 16. Yamada also discloses that the alignment of the molecules of liquid crystal region and regulated by the resin walls (Col. 10, lns. 13-49). Furthermore, in FIGs. 44(b) and 44(a), for example, the molecules of liquid crystal in the vicinity of the substrates in the liquid crystal region are aligned horizontally to the substrate surface by the resin walls when no voltage is applied between the substrates. However, Yamada fails to show that the amount of the liquid crystal in the vicinity of the substrates in the liquid crystal region are aligned vertically to the substrate surface by the resin walls when no voltage is applied between the substrates, as in the present invention.

Accordingly, the combination of Arakawa and Yamada cannot achieve the advantage of the present invention, namely, no generation of the “white line” when a voltage is not applied between the substrates. Thus, display quality is lowered. More specifically, the present invention overcomes the problem of formation of a “white line” by using liquid crystal that has negative anisotropy. Thus, the molecules of the liquid crystal can be aligned vertically to the substrate surface when no voltage is applied between the substrates, and generation of the “white line” can be prevented.

In addition to the above, Applicants submit that one skilled in the art would not be motivated to combine the liquid crystal display panel of Yamada with the liquid crystal of Arakawa having negative anisotropy. This is because Yamada teaches that in order to make the driving voltage of the liquid crystal display panel low, the dielectric anisotropy constant of the liquid crystal, which is 3 or more, is preferred. Thus, a dielectric anisotropy of 3 or more is used in the liquid crystal display panel of Yamada. If the liquid crystal of Arakawa, however, was used in the liquid crystal display of Yamada, loss of the advantage cited by Yamada would occur. Namely, a low driving voltage is not achieved when the liquid crystal of Arakawa is provided in the liquid crystal display panel of Yamada. For all of the above reasons, Applicant respectfully requests withdrawal of the §103 rejection of claims 1-2 and 4-6.

Claim 3 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Arakawa in view of Yamada, and further in view of Yamada, and further in view of Nam et al. (U.S. Patent Application No. 2002/0039160). Applicant respectfully traverses the rejection for the reasons recited above with respect to the rejection of independent claim 1.

The Examiner cites Nam as disclosing an acrylate monomer that is used as the alignment control agent for the benefit of increasing the cross linking index of the alignment film (see par. 0048 and 0050). However, Nam fails to disclose or suggest an alignment regulate layer that causes liquid crystal molecules to align vertically to the substrate surface, as now recited in amended claim 1. Rather, FIG. 4 of Nam shows liquid crystal molecules orientated horizontally with respect to the surfaces 403a and 403b. Therefore, the

combination of Nam, Arakawa, and Yamada fail to disclose or suggest the alignment regulate layer. For this reason, withdrawal of the §103 rejection is respectfully requested.

Claims 7-12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Arakawa in view of Yamada and Nam, and further in view of Shibahara (U.S. Patent Application Publication No. 2002/0008836). In response, Applicant amended independent claims 7 and 11 similar to independent claims 1 and 4, and respectfully traverses the rejection for the reasons recited above with respect to the rejection of independent claims 1 and 4.

Shibahara is cited by the Examiner as disclosing column-like spacers for maintaining an interval between a pair of substrates constant. Shibahara is silent regarding an alignment regulate layer formed on a liquid crystal side surfaces of the pair of substrates that aligns liquid crystal molecules vertically to the substrate surface, as now recited in amended independent claims 7 and 11. Therefore, the combination of Shibahara and the other cited references fails to disclose or suggest the presently claimed alignment regulate layer. For this reason, withdrawal of the §103 rejection of claims 7-12 is respectfully requested.

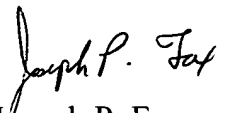
New claims 13-16 are added and depend from independent claims 1, 4, 7 and 11, respectively. New claims 13-16 further recite the feature of the liquid crystal composition including fluorine. Applicant earnestly solicits allowance of new claims 13-16 for the feature they each recite, and also for the reasons recited above with respect to the rejection of the independent claims.

For all of the foregoing reasons, Applicant submits that this Application is in condition for allowance, which is respectfully requested. The Examiner is invited to contact the undersigned attorney if an interview would expedite prosecution.

Respectfully submitted,

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